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# Taxonomic Identity of *Musa nagensium* (Musaceae) in Southeast Asia

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**ABSTRACT.** Since the early 20th century, the taxonomic identity of *Musa nagensium* Prain (Musaceae) has been uncertain to most botanists. The aim of this paper is to clarify the taxonomic history of *M. nagensium*. A new variety, *M. nagensium* var. *hongii* Häkkinen, is described and illustrated here. This rare variety of *M. nagensium* was found only in a small area in northwestern Yunnan, China, near the Burmese border. This study is based on observed morphological characteristics in the field and from specimens in various herbaria, and is supported by the existing literature on the Musaceae. A key to *M. nagensium* and related taxa is provided.

**Key words:** China, IUCN Red List, *Musa*, Musaceae, wild banana, Yunnan.

*Musa nagensium* Prain (Musaceae) was initially described by David Prain in the Royal Botanic Garden, Calcutta (today the Indian Botanic Garden, Howran), based on the plant grown from rootstock collected from the Naga Hills region in the states of Nagaland and Assam, India (Prain, 1904). *Musa nagensium* is also mentioned in other literature, but without detailed descriptions (Fawcett, 1913; Fisher, 1931; Wilson, 1946; Cheesman, 1948; Simmonds, 1956a, b, 1960; Champion, 1967; Simmonds & Weatherup, 1990; Hore et al., 1992; Liu et al., 2002; Uma et al., 2005). However, its true status fell into oblivion and it is today unknown to most botanists. It is commonly confused with *M. cheesmanii* Simmonds (Simmonds, 1956a), which grows in upper Assam (Uma et al., 2005). *Musa nagensium* has been reported to grow in the Naga Hills region, its original habitat, sympatric with *M. balbisiana* Colla (Colla, 1820; Häkkinen, pers. obs.). In contrast, the new variety *M. nagensium* var. *hongii* Häkkinen is sympatric with *M. acuminata* Colla var. *chinensis* Häkkinen & H. Wang, *M. balbisiana*, *M. itinerans* Cheesman var. *chinensis* Häkkinen, and *M. yunnanensis* Häkkinen & H. Wang in Tongbiguan Nature Reserve, west Yunnan, China, and in the adjacent Xima area (Häkkinen & Wang, 2007; Häkkinen et al.,

2008). No hybridization between the species in sympatric growth was observed (Häkkinen, 2006, pers. obs.). G. B. Wilson noted in his cytological studies in Jamaica that there are two different varieties of *M. nagensium*, but he did not further specify them, only mentioning that the plants originated in botanical collections (Wilson, 1946).

Extensive field observations were made by the author during an expedition in 2006 to Yunnan Province, Yingjiang District, China. The new variety is described based on living plants in the field by completing the International Network for the Improvement of Banana and Plantain (INIBAP) *Musa* descriptor list (IPGRI-INIBAP/CIRAD, 1996). The descriptive terms here follow the traditional banana taxonomy as used by Simmonds (1962, 1966). Relevant portions of the specimens were deposited as holotype at the herbarium of the Xishuangbanna Tropical Botanical Garden (HITBC), and isotypes were deposited at the herbaria of H, IBSC, and MO.

**1. *Musa nagensium*** Prain, J. Asiat. Soc. Bengal 73: 21. 1904. TYPE: [India.] Assam: Nagaland, Joboca, Calcutta, Royal Bot. Garden, 3 Sep. [19]03, *Abdul Huq s.n.* (lectotype, designated by Liu et al., 2002, K; isotypes, BM, E).

**1a. *Musa nagensium* var. *nagensium*.** Figure 1A.

**Distribution and habitat.** Variety *nagensium* is native to the Naga Hills region in the states of Nagaland and Assam, India. It is assumed to now be rather rare because its occurrence has not been reported since 1992 (Hore et al., 1992; Häkkinen, pers. obs.).

**IUCN Red List category.** Only a few plants of variety *nagensium* were seen in the Naga Hills region in the states of Nagaland and Assam, India. This taxon is of conservation concern and should be considered at least Vulnerable (VU) according to IUCN Red List criteria (IUCN, 2001). Further study is needed in Nagaland, India, and in adjacent Burma.

**Discussion.** *Musa cheesmanii* has been commonly misidentified as *M. nagensium* var. *nagensium* (Uma



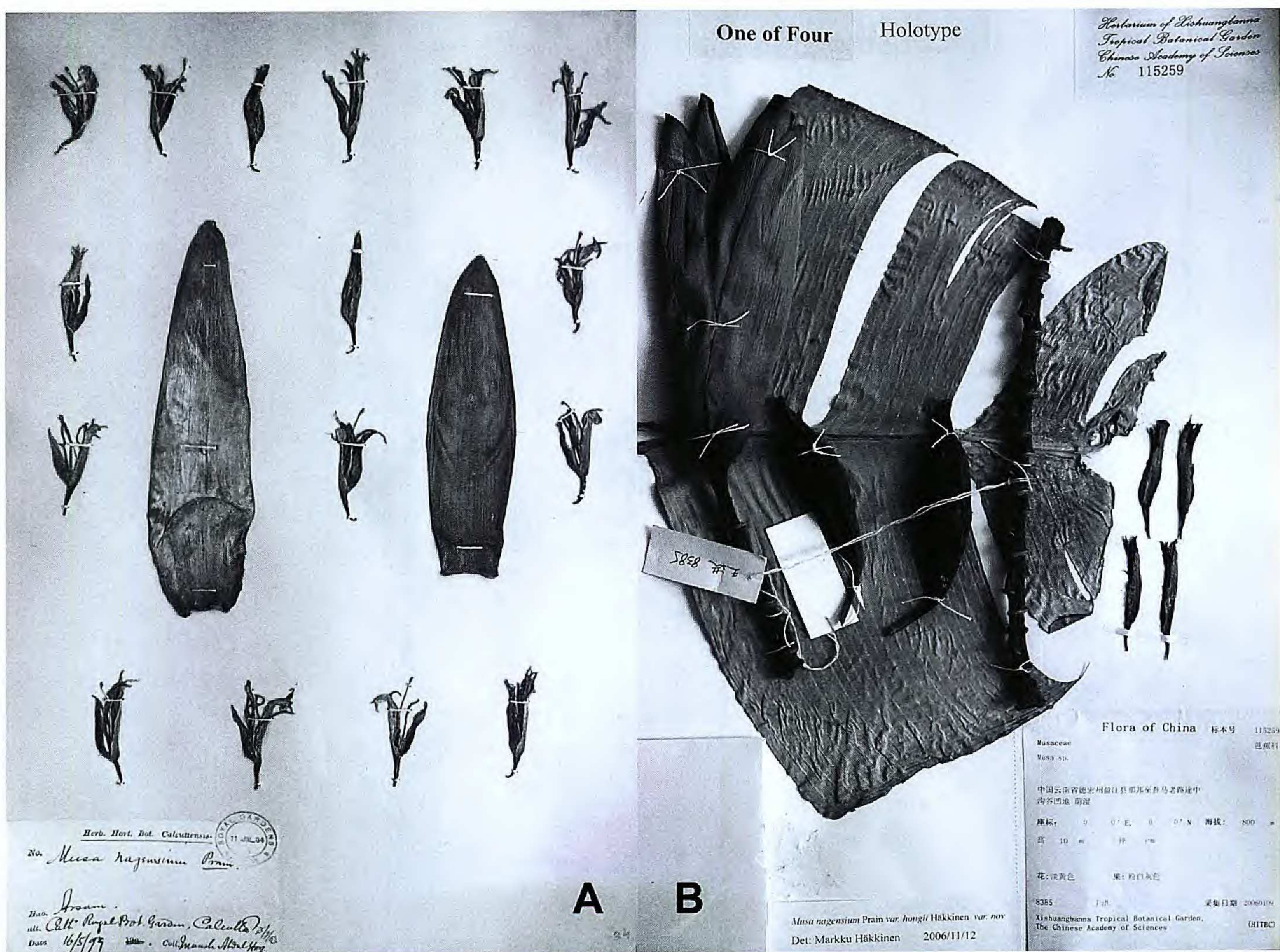


Figure 1. *Musa nagensium* Prain. —A. Lectotype of *M. nagensium* var. *nagensium* (Abdul Huq s.n., K). Photo by M. Häkkinen. —B. Holotype of *M. nagensium* var. *hongii* Häkkinen (Wang Hong 8385, HITBC). Photo by Wang Hong.

et al., 2005; Häkkinen, pers. obs.). This is because the pure form of variety *nagensium* is no longer found in its natural habitat. *Musa cheesmanii* can be easily distinguished from *M. nagensium* by its upward-pointing fruits versus the downward-pointing fruits of *M. nagensium* (Fig. 2). High genetic variation of *M. nagensium* in those known locations is due to environmental stress caused by its mountainous habitat. In order for this species to survive in the various environments, it underwent substantial genetic changes and evolved into different varieties. This is quite a common phenomenon in wild bananas (Häkkinen, 2003, 2004, 2006; Häkkinen & Meekiong, 2004, 2005; Häkkinen et al., 2005, 2007). The chromosome number ( $2n = 22$ ) for *M. nagensium* was determined by Wilson (1946).

*Additional specimens examined.* BURMA. **Myitkyina** **Distr.:** Tagwin Chaung, in evergreen forest, 24 Nov. 1928, C. E. Parkisson 1759 (K). INDIA. **Assam:** Nagaland, Royal Bot. Garden Calcutta, 3 Sep. [19]03, Abdul Huq (BM, E), Nagaland, 1960, NRFP 60 (E).

**1b. *Musa nagensium* var. *hongii* Häkkinen, var. nov.** TYPE: China. Yunnan: Dehong Distr., Yingjiang Co., Xima, old way from Xima to

Tongbiguan, seasonal rainforest, wet valley, 800 m, 9 Jan. 2006, Wang Hong 8385 (holotype, HITBC [4 sheets]; isotypes, H, IBSC, MO). Figure 1B.

Varietas nova a varietate typica facie bractee floralis exteriore laete flava vel aurantiaca, marginibus rubrescentibus (non lateritio-miniata), bractearum apicibus obtusis imbricatisque (non apicibus acutis convolutisque) et fructu minore, ca.  $9 \times 3.5$  cm (non  $12-15 \times 3$  cm) distinguitur.

Plant tall, suckering close to parent plant 20–50 cm, to 5 suckers, vertically arranged; mature pseudostem to 11 m, to 25 cm diam. at base, of variable appearance with dead brown waxy sheaths, underlying color ivory with large pink-purple blotches, shiny; sap milky. Petiole to 50 cm, canal margins overlapping, bases winged and clasping the pseudostem with corrugated margins; leaves erect, lamina to  $200 \times 65$  cm, narrowly elliptic, truncate at the apex, adaxially dark green, dull, abaxially silvery, very waxy; leaf bases asymmetric, both sides rounded and auriculate, midrib light green on both sides, with slightly corrugated lamina. Inflorescence arching vertically downward; peduncle to 70 cm, ca. 3 cm in diam., glabrous, light green, waxy; 2 sterile bracts present, persistent at the opening of the first female





Figure 2. Fruit bunch of *Musa nagensium* Prain var. *hongii* Häkkinen. Photo by M. Häkkinen at Tongbiguan Nature Reserve, Yunnan, China.

flowers. Female bud lanceolate, to  $43 \times 8$  cm, bracts externally bright yellow to orange with reddish margins and very waxy, bright yellow without wax internally, imbricate, obtuse and lifting one bract at a time, not revolute before falling; basal flowers female, ca. 15 cm; ovary light green, with ovules arranged in 2 rows per locule; compound tepal ca. 4.5 cm with 2 prominently thickened keels, orange; free tepal ca. 4.5 cm, oval with thickened keel, translucent white with orange apex; stamens 5, ca. 3.5 cm, lacking pollen, light green; stigma brown, ca. 0.8 cm diam.; male bud lanceolate, ca.  $25 \times 5.5$  cm, bracts externally bright yellow to orange with reddish margins and very waxy, bright yellow without wax internally, imbricate, lifting one bract at a time, not revolute before falling; male flowers on average 12 per bract in 2 rows, falling with the bracts; compound tepal ca. 4.6 cm with 2 thickened keels, orange; free tepal ca. 3 cm, oval with thickened keel, translucent white with orange apex; stamens 5, ca. 1 cm, filaments light green; anthers orange to brown, inserted; stigma light green, ovary arched, light green, without additional pigmentation. Fruit bunch compact, with 7 hands and 14 fruits per hand on average, in 2 rows, fingers hanging downward toward the long pendulous rachis; individual fruit ca.  $9 \times 3.5$  cm, slightly

curved, pronouncedly ridged, pedicel 3.5 cm, glabrous, fruit apex long-pointed with some floral relicts, immature fruit peel silvery, very waxy, remaining silvery at maturity with some black-purple blotches, immature fruit pulp white, remaining white and soft at maturity; seeds irregularly rounded, ca.  $11 \times 7$  mm, with seed coat warty brownish black except for the white circum-hilar area, 60 to 80 seeds per fruit.

*Distribution and habitat.* *Musa nagensium* var. *hongii* is very common in Yingjiang County, Dehong, Yunnan, in the area bordering Burma, occurring typically at elevations from 800–1300 m in moist ravines (Häkkinen, pers. obs.). It is reported (Cheesman, 1948) occurring in Myitkyina District, Burma, but these areas need further study.

*IUCN Red List category.* One variety of *Musa nagensium* has been studied by the author in China in 2006. Variety *hongii* has 25 known wild populations in the border area west of Yunnan and continuing toward Burma (Häkkinen, pers. obs.). As a result, the author designates its conservation status as Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).

*Etymology.* The new variety of *Musa nagensium* is named in honor of curator Wang Hong from the Xishuangbanna Tropical Botanical Garden Herbarium for his contributions to the botany of China.

*Discussion.* Variety *hongii* can be distinguished from the typical variety of *Musa nagensium* by the external flower bract coloration (bright yellow to orange with reddish margins vs. brick red to flame scarlet); the obtuse and imbricate bract apices (vs. acute and convolute); and shorter fruits (ca.  $9 \times 3.5$  cm vs.  $12\text{--}15 \times 3$  cm).

*Paratypes.* CHINA. **Yunnan:** Dehong Distr., Yingjiang Co., Xima, Mu Lai River, mtn. slope, 930 m, 8 Jan. 2006, Wang Hong 8383 (HITBC); Tongbiguan Nature Reserve, 1050 m, Apr. 1996, A. Kimura & T. Goto s.n. [seeds donated to Kew by Atagawa Tropical Garden, 20 Feb. 1998; voucher on 24 Oct. 2000, cult. plants at Kew identified by Häkkinen Apr. 2002] (K [2]).

KEY TO THE SPECIES OF *MUSA* AND VARIETIES OF *M. NAGENSIMUM* IN CHINA, INDIA, AND BURMA

- 1a. Flower bracts externally flame scarlet; bract apices acute and convolute. . . . *M. nagensium* var. *nagensium*
- 1b. Flower bracts externally bright yellow to orange with reddish margins; bract apices obtuse and imbricate . . . . . 2
- 2a. Mature fruits pointing downward toward male bud . . . . . *M. nagensium* var. *hongii*
- 2b. Mature fruits pointing upward toward peduncle . . . . 3
- 3a. Pseudostem with underlying color brownish red; sap milky; lamina hardly waxy, grayish; seeds flattened, ca.  $8 \times 5$  mm. . . . . *M. cheesmanii*



- 3b. Pseudostem with underlying color yellowish green; sap watery; lamina without wax, glaucous; seeds globose, ca.  $5 \times 4$  mm . . . . . 4
- 4a. Male bud broadly ovoid with obtuse apex, bracts imbricate, internally dark crimson, lifting several bracts at the same time, not revolute . . . *M. balbisiana*
- 4b. Male bud lanceolate with pointed yellowish apex, no imbrication, internally cream, lifting several bracts at a time, revolute . . . . . 5
- 5a. Petiole margins curved inward; leaf bases auriculate; peduncle pubescent with short hairs; arrangements of ovules in 4 rows per locule . . *M. yunnanensis*
- 5b. Petiole margins erect; leaf bases rounded; peduncle glabrous; arrangements of ovules in 2 rows per locule . . . . . *M. acuminata* var. *chinensis*

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